PROTECTIVE IRRIGATION WORKS,

RAJPUTANA.

GIRWAR TANK PROJECT

IN THE

SIROHI STATE.

1905.

AJMER:
SCOTTISH MISSION INDUSTRIES CO., LTD.
1905.

INDEX.

PLANS.

GIRWAR TANK PROJECT IN THE SIROHI STATE.

Reference—Para. 61 of Report on Irrigation in the Sirohi State.

REPORT.

Site described.

1. At the south-west end of the Abu Hill, not far from Girwar, and about two miles south of the existing Chandela tank, there is a site for another tank, where one of the Abu streams passes out of the hills.

The catchment area is 6¼ square miles, forming the eastern slope of the Abu Hill, and all the nullahs which drain this area fall into a basin formed by the hills, and unite to pass through a gap which it is proposed to close to form the storage reservoir.

The Dam would be in two lengths, with a total length of 1,100 r.ft. Starting from the hills on the south it would cross to a small hill on the right bank of the nullah, and then on the north of this hill it would cross the nullah, and close the main gap between the hills.

All this part of the Sirohi State is inhabited by Bhils; and if the project is not carried out before, it would be a usefnl work should another Famine occur, as in addition to the relief it would afford, there is a large area of land available for irrigation which would be benefited and bring an increased revenue if the Tank was constructed.

Water available for Storage.

2. We may safely assume that the average rainfall on this hilly catchment is 30 inches and that 20 per cent. will be available for storage, or 87½ m.c.ft. of water.

Water-spread and Capacity at different Contours.

3. The following table gives the water-spread and capacity at different contours, the bed of the nullah at site being taken as R. L. 97:—

R. L.	Waterspread in s.ft.	Capacity in m.c.ft.
130	10,920,000	29·64
127	8,840,000	16·60
125	7,760,000	27·30
120	3,400,000	17·46
110	92,000	3·68
97 (Bed)		
	Total ...	95·28

Weir Level and Capacity.

4. It is proposed to make weir level R. L. 128; this will give a capacity of 75·28 m.c.ft., which is sufficient for our requirements.

Maximum Discharge and Length of Weir.

5. The maximum discharge on the 6½ square miles of catchment is 3,044 cusecs; and to discharge this with a 2-ft. head a Weir 305 ft. in length is required, and has been provided.

The Weir will be at the south end of the Dam, partly cut out of the rocky hill side, the remainder a masonry wall taken down and into rock for foundations, 2½ feet thick at top, front batter 1 in 12, and rear batter 1 in 4.

Dam.

6. The Dam will have a masonry Core-wall with earth slopes in front and rear for its whole length, as the soil is rocky.

The Core-wall will start at R. L. 134, the crest level of dam, *i.e.*, 6 ft. above weir level and 4 ft. above flood level. It will be 1½ ft. thick at top, and increase 6 inches in thickness at every 5 ft. depth, and the foundations will be taken down to and countersunk in the rock, which is close to the ground surface.

The earthwork in front will start at R. L. 131, or 1 ft. above flood level, with a terrace 4 ft. in width and a front slope of 3 to 1; both the terrace and front slope will be protected by a layer of dry stone pitching 9 inches in thickness, laid on 3 inches of kunkar or chips.

The earthwork in rear will start at R. L. 132·5, have a top width of 7 ft. and rear slope of 2 to 1.

The core-wall will thus form a parapet to the 7-ft. pathway on the top of the rear slope.

Sluice.

7. A Sluice is provided at chainage 1,860 with sill level R. L. 110, giving 71·60 m.c.ft. of water available for irrigation, sufficient for 716 acres.

To discharge this in four months the sluice must discharge—

$$D = \frac{71{\cdot}6}{4 \times 2{\cdot}592} = 6{\cdot}9 \text{ cusecs.}$$

It must also discharge enough to give a first watering of 1 ft. in 30 days of 12 hours' flow to the whole 716 acres commanded.

$$D = \frac{716 \times 43560}{30 \times 12 \times 60 \times 60} = \frac{31388960}{1296000} = 24{\cdot}2 \text{ cusecs.}$$

A 1¼-ft. diameter sluice will discharge 7·5 cusecs with 1 ft. head, and with 11 ft. head 25 cusecs—and unless the tank was nearly full a first watering to the whole 716 acres would not be given—so will satisfy requirements, and has been provided.

Design for Sluice.

8. The design consists of two masonry sluice chambers, and the sluice pipe fixed in the wall dividing the two, and the rear wall of the inner chamber connected with the core-wall of the dam. The face-wall of the outer chamber has an opening up its whole height with double grooves 1½ ft. apart, into which planks can be put, with earth rammed between, to shut off the water at any time when it is necessary to examine and repair the sluice. An iron grating with vertical bars is also provided to prevent

brushwood or anything likely to block the pipe or valves passing into the sluice well. Wing-walls with steps are provided in front of the outer chamber. The Sluice is of cast iron with gun-metal faces and fitted with two valves, one outside the sluice well, and the other inside, so that if one valve gets out of order the one at the other end can be closed at once and opened after the necessary repairs have been carried out. The valves are opened by vertical rods with screwed heads, and the screw wheel at the top should show clearly how much the valve is open at any time. A wooden platform on iron rails is provided from which to work the sluice. A masonry drain runs from the inner sluice chamber under the rear slope of the Dam, connected with the Irrigation Channel.

Irrigation Channel.

9. The Irrigation Channel has been surveyed for 3,250 ft. where it passes through the hills (See Plan No. 1), after this the plain to be irrigated is reached and there is no difficulty. A channel one mile in length for this portion is provided in the estimate. The channel will have a fall of 2 ft. per mile, and to discharge 24·2 cusecs will require a bed width of 5 ft., depth of 2½ ft., and side slopes of 1 to 1.

Materials.

10. Building stone and wood for fuel are procurable at site, lime will have to be brought from Abu Road, a distance of 12 miles.

Abstract Estimate of Cost.

11. The Abstract Estimate of Cost is:—

		Rs.	Rs.
(*a*) Dam			
Core-wall		18,652	
Earthwork		8,658	
Pitching		2,158	
			29,468
(*b*) Weir and Wing-wall			944
(*c*) Sluice			4,039
(*d*) Irrigation Channel			380
(*e*) Contingencies			1,742
	Total	...	36,573

Value of Water stored.

12. The value of water stored is 2058 c.ft. per rupee.

Revenue.

13. If all the 716 acres for which there is water are irrigated, allowing Rs. 4 per acre, an annual Revenue of Rs. 2,864 should be realized, giving a profit of over 7¾ per cent. on the estimated cost.

For land cultivated by Bhils the Revenue is not assessed or realized in cash; but the same rate per acre has been assumed for this project as for others prepared in the Sirohi State.

Preparation of Project.

14. The surveys and Plans were prepared by Sub-Overseer Laxmi Narain and the Estimate by Overseer Ramchander, under the orders of the Superintending Engineer, Protective Irrigation Works.

SPECIFICATION.

Dimensions. 15. All the dimensions of the dam are given in the Plans and Estimate, which are to be strictly adhered to.

Marking out. 16. The centre line and slopes to be marked out with trenches 1 ft. broad and 1 ft. deep, showing permanently the inner and outer slopes, and the breadth of the top of the embankment.

Earthwork. 17. The embankment will be carried out in layers not exceeding 9 inches in thickness, carefully consolidated.

All the layers will be laid concave, that is, lower in the centre. No clods of earth should on any account be allowed in the embankment. No earth to be excavated within 100 ft. of either toe of the slopes.

Pitching. 18. The surface of the inner slope and the terrace on top to be protected by a layer of dry rubble stone 9 inches thick, on 3 inches of kunkar or chips.

Masonry. 19. The masonry of the Core-wall, outlet Sluice, Weir, &c., to be of rubble stone set in lime mortar, only hard and durable stones to be used; and the masonry to be kept wet during construction. All the stones to be hammer-dressed and to break joint in the same as well as in the successive courses.

All stones are to be laid on their natural beds; where there is batter the beds of the stones are to be at right angles to the batter. Hollows between the larger stones to be filled in with smaller ones completely embedded in mortar. No empty hollow to be left nor spaces filled wholly with mortar or rubbish where pieces of stones ought to have been inserted.

The faces of the masonry in contact with the earth to be left quite rough and those remaining exposed to be smoothed and pointed with lime mortar.

Concrete. 20. The concrete to consist of three parts broken stones to one part lime mortar, well mixed together before putting in foundations, and to be laid in 6-inch layers and well rammed.

Lime. 21. The lime to be good stone lime burnt in kilns.

Mortar. The mortar to consist of one part of lime to 1½ parts surkee.

Irrigation Channel. 22. All the cutting to be done as per section, with required slope in bed. All the excavated earth to be stacked in spoil banks leaving a berm of 5 ft. on either side of the canal.

F. ST.-G. MANNERS SMITH,
SUPERINTENDING ENGINEER,
Protective Irrigation Works, Rajputana.

AJMER,
17th June 1905.

Abstract Estimate of Cost.

Girwar Tank Project in the Sirohi State.

Quantity or Number.	Items.	Rate.	Per	Amount.	Total.	
	(1) Dam.			Rs.	Rs.	Rs.
1,731,605 c.ft.	(a) Earthwork ...	5—0	1,000 c.ft.	8,658		
61,657 „	(b) Pitching	3—0	100 „	1,850		
20,552 „	(c) Kunkar	1—8	100 „	308		
					10,816	
	(d) Core-Wall.					
9,736 c.ft.	(a) Rock—Excavation ...	15—0	1,000 c.ft.	146		
19,472 „	(b) Excavation—Earth and Boulders	8—0	1,000 „	156		
101,942 „	(c) Masonry	18—0	100 „	18,350		
					18,652	
						29,468
	(2) Weir and Wing-Wall.					
12,915 c.ft.	(a) Excavation—Rock ...	15—0	1,000 c.ft.	194		
4,170 „	(b) Masonry	18—0	100 „	750		
					944	944
	(3) Sluice.					
17,863 c.ft.	(a) Excavation—Rock ...	15—0	1,000 c.ft.	89		
	(b) Excavation—Earth and Boulders	8—0	1,000 „	95		
6,805 „	(c) Concrete	10—0	100 „	681		
3,100 „	(d) Flooring Masonry ...	18—0	100 „	558		
9,199 „	(e) Superstructure Masonry	18—0	100 „	1,656		
554 c.ft.	(f) Arch Masonry ...	24—0	100 „	133		
100 s.ft.	(g) Grating	1—0	s. ft.	100		
250 r.ft.	(h) Ladders	0—4	r. ft.	63		
92 „	(k) Girders	1—0	„	92		
48 s.ft.	(l) Stone work ...	1—0	s. ft.	48		
No.	(m) Sluice valves and pipes 1¼ ft. dia., with gun-metal faces and vertical rods with screw heads...	350—0	each	350		
58 c.ft.	(n) Woodwork ...	3—0	c.ft.	174		
					4,039	4 039
	(4) Irrigation Channel.					
95,000 c.ft.	(a) Excavation ...	4—0	1,000 c.ft.	380	380	380
						34,831
	Contingencies ...	5—0	per cent.	...		1,742
	Grand Total ...		...	...		Rs. 36,573